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1 1. A man-machine interface method for permitting a user  
2 to act on thumbnails, each thumbnail representing an  
3 associated object containing information, for use with a  
4 machine having a video display device and a user input  
5 device, the man-machine interface method comprising:

- 6 a) generating a three-dimensional environment, having  
7 a depth, to be rendered on the video display device;  
8 b) determining a two-dimensional location and a depth  
9 of each of the thumbnails in the three-dimensional  
10 environment, wherein, for each of the thumbnails, the  
11 depth is a function of at least one parameter of the  
12 object associated with the thumbnail; and  
13 c) generating the thumbnails within the  
14 three-dimensional environment, at the determined  
15 two-dimensional locations and depths, to be rendered  
16 on the video display device.

1 2. The man-machine interface method of claim 1 wherein,  
2 for each of the thumbnails, the depth is a linear function  
3 of at least one parameter of the object associated with the  
4 thumbnail.

1 3. The man-machine interface method of claim 1 wherein,  
2 for each of the thumbnails, the depth is a polynomial  
3 function of at least one parameter of the object associated  
4 with the thumbnail.

1 4. The man-machine interface method of claim 1 wherein,  
2 for each of the thumbnails, the depth is an exponential  
3 function of at least one parameter of the object associated  
4 with the thumbnail.

1 5. The method of claim 1 wherein the at least one  
2 parameter includes at least one parameter selected from a  
3 group of parameters consisting of (a) click history, (b)  
4 age, (c) time since last use, (d) size, (e) file type, (f)  
5 associated application, (g) classification, and (h) author.

1 6. The man-machine interface method of claim 1 further  
2 comprising:  
3 d) accepting inputs from the user input device;  
4 e) determining a two-dimensional cursor location  
5 based on the accepted inputs; and  
6 f) generating a cursor at the determined  
7 two-dimensional cursor location, to be rendered on the  
8 video display device.

1 7. The man-machine interface method of claim 6 further  
2 comprising:  
3 g) if the two-dimensional location of the cursor is  
4 located on or over one of the thumbnails, defining a  
5 state of that thumbnail as active.

1 8. The man-machine interface method of claim 7 further  
2 comprising:  
3 h) generating a pop-up information bar located over  
4 the active thumbnail, to be rendered on the video  
5 display device.

1 9. The man-machine interface method of claim 7 further  
2 comprising:

3           h) if the user input provides a selection input and  
4           if an active or floated thumbnail exists, then  
5           generating a higher resolution visual representation  
6           of the object represented by and associated with the  
7           active or floated thumbnail, at a preferred viewing  
8           location at a foreground of the three dimensional  
9           environment, to be rendered on the video display  
10          device.

1          10. The man-machine interface method of claim 7 further  
2          comprising:

3           h) if the user input provides a float input and if an  
4           active thumbnail exists, then setting the depth of the  
5           active thumbnail to a predetermined value and defining  
6           a state of the active thumbnail as floated.

1          11. The man-machine interface method of claim 9 wherein  
2          the act of generating the higher resolution visual  
3          representation of the object represented by and associated  
4          with the active thumbnail includes:

5           - generating an animation which moves the higher  
6           resolution visual representation of the object  
7           represented by and associated with the active  
8           thumbnail from the location of the active  
9           thumbnail to the preferred viewing location at  
10          the foreground of the three dimensional  
11          environment, to be rendered on the video display  
12          device.

1          12. The man-machine interface method of claim 11 further  
2          comprising:

3           i) if the user input provides a deselection input and  
4           if a selected thumbnail exists, then generating a  
5           video output for moving the high resolution visual  
6           representation of the object represented by and  
7           associated with the active thumbnail to the  
8           two-dimensional location of the selected thumbnail, to  
9           be rendered on the video display device.

1       13. The man-machine interface method of claim 9 further  
2       comprising:

3           i) if the user input provides a sink input and if a  
4           floated thumbnail exists, then setting the depth of  
5           the floated thumbnail to a previous value and defining  
6           a state of the floated thumbnail as active.

1       14. The man-machine interface method of claim 7 further  
2       comprising:

3           h) if the user input provides a selection input and  
4           if an active thumbnail exists, then  
5                i) invoking an application related to the object  
6                represented by and associated with the active  
7                thumbnail,  
8                ii) loading the object represented by and  
9                associated with the active thumbnail into the  
10              application, and  
11              iii) generating a video output of the application  
12              with the loaded object represented by and  
13              associated with the active thumbnail at a  
14              preferred viewing location, to be rendered on the  
15              video display device.

1 15. The man-machine interface method of claim 9 further  
2 comprising:

- 3 h) if the user input provides a selection input and  
4 if a floated thumbnail exists, then  
5 i) invoking an application related to the object  
6 represented by and associated with the floated  
7 thumbnail,  
8 ii) loading the object represented by and  
9 associated with the floated thumbnail into the  
10 application, and  
11 iii) generating a video output of the application  
12 with the loaded object represented by and  
13 associated with the floated thumbnail at a  
14 preferred viewing location, to be rendered on the  
15 video display device.

1 16. The man-machine interface method of claim 7 further  
2 comprising:

- 3 h) if the user input provides a move input and if an  
4 active or floated thumbnail exists, then  
5 i) updating the two-dimensional location of the  
6 active or floated thumbnail based on the move  
7 input.

1 17. The man-machine interface method of claim 16 wherein  
2 the move input is a left button mouse drag.

1 18. The man-machine interface method of claim 1 wherein  
2 the three-dimensional environment defines a foreground and  
3 a background, and

4            wherein the act of generating thumbnails, within the  
5            three-dimensional environment, at the determined  
6            two-dimensional locations and depths, to be rendered on the  
7            video display device, includes:

8            i)    using perspective views so that any thumbnails in  
9            the foreground defined by the three-dimensional  
10           environment appear larger than any thumbnails in the  
11           background defined by the three-dimensional surface.

1           19. The man-machine interface method of claim 18 wherein a  
2           thumbnail partially occludes any thumbnails behind it,  
3           based on a viewing point.

1           20. The man-machine interface method of claim 1 further  
2           comprising:

3           d)    accepting inputs from the user input device;  
4           e)    determining a viewing point two-dimensional  
5           location, depth and direction based on the accepted  
6           inputs; and  
7           f)    generating only that portion of the  
8           three-dimensional environment and only those  
9           thumbnails that are in front of the virtual viewing  
10           point determined in act (e), to be rendered on the  
11           video display device.

1           21. The man-machine interface method of claim 1 wherein  
2           the thumbnails are low resolution bit maps.

1           22. The man-machine interface method of claim 21 wherein  
2           the low resolution bit maps are 64 pixels by 64 pixels and  
3           have 24 bit color.

1 23. The method of claim 20 wherein if the depth of the  
2 viewing point is below a predetermined depth, further  
3 performing a step of:

4 g) gradually decreasing the depth of the viewing  
5 point to float the viewing point while no user inputs  
6 are received.

1 24. The method of claim 1 further comprising, for each of  
2 the thumbnails, determining a shade to be applied to the  
3 thumbnail based on its depth.

1 25. The method of claim 24 wherein the shade to be applied  
2 to the thumbnail darkens as the depth increases.

1 26. The method of claim 24 wherein the shade to be applied  
2 to the thumbnail darkens as a distance between the depth of  
3 the thumbnail and a viewing point increases.

1 27. The method of claim 1 further comprising, for each of  
2 the thumbnails, determining a fade to be applied to the  
3 thumbnail based on its depth.

1 28. The method of claim 27 wherein the fade to be applied  
2 to the thumbnail increases as the depth increases.

1 29. The method of claim 27 wherein the fade to be applied  
2 to the thumbnail increases as a distance between the depth  
3 of the thumbnail and a viewing point increases.

1 30. The method of claim 1 further comprising, for each of  
2 the thumbnails, determining a tint to be applied to the  
3 thumbnail based on its depth.

1 31. The method of claim 30 wherein the tint to be applied  
2 to the thumbnail increases as the depth increases.

1 32. The method of claim 30 wherein the tint to be applied  
2 to the thumbnail increases as a distance between the depth  
3 of the thumbnail and a viewing point increases.

1 33. The method of claim 1 wherein the three dimensional  
2 environment includes a floor, the method further comprising  
3 a step of generating a shadow, for each of the thumbnails,  
4 on the floor.

1 34. A system which permits a user to interact with  
2 thumbnails, each thumbnail representing an associated  
3 object containing information, the system comprising:

4 a) an input facility for accepting user inputs;

5 b) a storage facility containing

6 i) a two-dimensional location, a depth and state  
7 information for each of the thumbnails,

8 ii) a two-dimensional cursor location, and

9 iii) a three-dimensional environment having a  
10 simulated depth;

11 c) a processing unit which

12 i) accepts user inputs from the input facility,

13 ii) updates (a) the two-dimensional location,

14 and state information for each of the thumbnails  
15 contained in the storage facility, and (b) the



16 two-dimensional cursor location contained in the  
17 storage facility, based on the accepted user  
18 inputs,  
19 iii) updates depth information for each of the  
20 thumbnails contained in the storage facility  
21 based on at least one parameter of the object  
22 associated with the thumbnail, and  
23 iv) generates video outputs based on  
24 A) the two-dimensional location, depth and  
25 state information for each of the  
26 thumbnails,  
27 B) the two-dimensional cursor location, and  
28 C) the three-dimensional environment,  
29 contained in the storage facility; and  
30 d) a video display unit for rendering the video  
31 outputs generated by the processing unit.

1 35. The system of claim 34 wherein the state information  
2 for each of the thumbnails contained in the storage  
3 facility includes an indication of whether or not the  
4 thumbnail is active, and  
5 wherein the processing unit determines that a  
6 thumbnail is active if a cursor is located on or over a  
7 thumbnail based on the two-dimensional location of the  
8 cursor and the two dimensional location of the thumbnail.

1 36. The system of claim 34 wherein the storage facility  
2 further contains descriptive textual information for each  
3 of the thumbnails, and  
4 wherein, if a thumbnail is active,

- 5           i) the processing unit generates a pop-up bar,  
6           based on descriptive textual information, for the  
7           active thumbnail, and  
8           ii) the video display unit renders the pop-up  
9           bar over the rendered thumbnail.

1       37. The system of claim 35 wherein, if a thumbnail is  
2       active or floated and the input facility accepts a  
3       selection input, then

- 4           i) the processing unit updates the state of the  
5           thumbnail,  
6           ii) the processing unit gets a second, higher  
7           resolution, visual representation of the object  
8           represented by and associated with the thumbnail,  
9           iii) the processing unit generates a video output  
10          based on the higher resolution, visual  
11          representation of the object represented by and  
12          associated with the thumbnail at a preferred  
13          viewing location, and  
14          iv) the video display device renders the video  
15          output generated by the processing unit.

1       38. The system of claim 37 further comprising an audio  
2       output device,

3           wherein the storage facility further contains a first  
4       audio cue, and

5           wherein, when an object is selected, the processing  
6       unit provides the first audio cue to the audio output  
7       device.

1 39. The system of claim 37 wherein each thumbnail is a 64  
2 pixel by 64 pixel bit map having 24 bit color and wherein  
3 each higher resolution, visual representation of the  
4 objects is a 512 pixel by 512 pixel bit map having 24 bit  
5 color.

1 40. The system of claim 37 wherein the processing unit  
2 further effects a video output based on an animation of the  
3 higher resolution, visual representation of the object  
4 represented by and associated with the thumbnail, moving  
5 from the location of the thumbnail to a location at the  
6 foreground of the three-dimensional environment.

1 41. The system of claim 35 wherein if the input facility  
2 provides a float input and an active thumbnail exists, then  
3 the processing unit will set the depth of the active  
4 thumbnail to a predetermined value and will define the  
5 state of the active thumbnail as floated.

1 42. The system of claim 35 wherein, if a thumbnail is  
2 active and the input facility accepts a selection input,  
3 then

4 i) the processing unit updates the state of the  
5 thumbnail to selected,

6 ii) the processing unit opens an application  
7 with which the object, associated with and  
8 represented by the selected thumbnail, is  
9 associated,

10 iii) the processing unit loads the object into  
11 the application,

12           iv) the processing unit generates a video output  
13           based on the object loaded onto the opened  
14           application and a preferred viewing location, and  
15           v) the video display device renders the video  
16           output generated by the processing unit.

1       43. The system of claim 41 wherein if the input facility  
2       provides a sink input and if a floated thumbnail exists,  
3       then the processing unit will set the depth of the floated  
4       thumbnail to a previous value and will define a state of  
5       the floated thumbnail as active.

1       44. The system of claim 37 wherein, if a thumbnail is  
2       active or floated and the input facility accepts a move  
3       input, then  
4           i) the processing unit updates the state and  
5           location of the thumbnail,  
6           ii) the processing unit generates a video output  
7           based on the updated location of the thumbnail,  
8           and  
9           iii) the video display device renders the video  
10          output generated by the processing unit.

1       45. The system of claim 35 wherein if a thumbnail is  
2       floated and the input facility accepts a selection input,  
3       then  
4           i) the processing unit updates the state of the  
5           thumbnail to selected,  
6           ii) the processing unit opens an application with  
7           which the object, associated with and represented by  
8           the selected thumbnail, is associated,

9           iii) the processing unit loads the object into the  
10           application,  
11           iv) the processing unit generates a video output  
12           based on the object loaded onto the opened application  
13           and a preferred viewing location, and  
14           v) the video display device renders the video output  
15           generated by the processing unit.

1       46. The system of claim 34 wherein the storage facility  
2       further contains virtual viewing point location  
3       information,  
4           wherein the input facility includes a mouse, and  
5           wherein the processing unit  
6           d) accepts inputs from the user input device;  
7           e) determines a viewing point location and direction  
8           based on the accepted inputs; and  
9           f) generates only that portion of the  
10          three-dimensional environment and only those  
11          thumbnails that are in front of the virtual viewing  
12          point determined in step (e), to be rendered on the  
13          video display device.

1       47. A machine readable medium containing data and machine  
2       executable instructions which, when executed by a machine,  
3       performs the method of claim 1.

1       48. A machine readable medium containing data and machine  
2       executable instructions which, when executed by a machine,  
3       performs the method of claim 6.

1 49. A machine readable medium containing data and machine  
2 executable instructions which, when executed by a machine,  
3 performs the method of claim 7.

1 50. A machine readable medium containing data and machine  
2 executable instructions which, when executed by a machine,  
3 performs the method of claim 8.

1 51. A machine readable medium containing data and machine  
2 executable instructions which, when executed by a machine,  
3 performs the method of claim 9.

1 52. A machine readable medium containing data and machine  
2 executable instructions which, when executed by a machine,  
3 performs the method of claim 10.

1 53. A machine readable medium containing data and machine  
2 executable instructions which, when executed by a machine,  
3 performs the method of claim 11.

1 54. A machine readable medium containing data and machine  
2 executable instructions which, when executed by a machine,  
3 performs the method of claim 12.

1 55. A machine readable medium containing data and machine  
2 executable instructions which, when executed by a machine,  
3 performs the method of claim 13.

1 56. A machine readable medium containing data and machine  
2 executable instructions which, when executed by a machine,  
3 performs the method of claim 14.

1 57. A machine readable medium containing data and machine  
2 executable instructions which, when executed by a machine,  
3 performs the method of claim 15.

1 58. A machine readable medium containing data and machine  
2 executable instructions which, when executed by a machine,  
3 performs the method of claim 18.

1 59. A machine readable medium containing data and machine  
2 executable instructions which, when executed by a machine,  
3 performs the method of claim 19.

1 60. A machine readable medium containing data and machine  
2 executable instructions which, when executed by a machine,  
3 performs the method of claim 20.

1 61. A man-machine interface method for permitting a user  
2 to act on thumbnails, each thumbnail representing an  
3 associated object containing information, for use with a  
4 machine having a video display device and a user input  
5 device, the man-machine interface method comprising:  
6 a) generating a three-dimensional environment, having  
7 a depth, to be rendered on the video display device;  
8 b) determining a two-dimensional location and a depth  
9 of each of the thumbnails in the three-dimensional  
10 environment, wherein, for each of the thumbnails, the  
11 depth is a function of at least one property of the  
12 object associated with the thumbnail; and  
13 c) generating the thumbnails within the  
14 three-dimensional environment, at the determined

15 two-dimensional locations and depths, to be rendered  
16 on the video display device.

1 62. A system which permits a user to interact with  
2 thumbnails, each thumbnail representing an associated  
3 object containing information, the system comprising:  
4 a) an input facility for accepting user inputs;  
5 b) a storage facility containing  
6 i) a two-dimensional location, a depth and state  
7 information for each of the thumbnails;  
8 ii) a two-dimensional cursor location, and  
9 iii) a three-dimensional environment having a  
10 simulated depth;  
11 c) a processing unit which  
12 i) accepts user inputs from the input facility,  
13 ii) updates (a) the two-dimensional location,  
14 and state information for each of the thumbnails  
15 contained in the storage facility, and (b) the  
16 two-dimensional cursor location contained in the  
17 storage facility, based on the accepted user  
18 inputs,  
19 iii) updates depth information for each of the  
20 thumbnails contained in the storage facility  
21 based on at least one property of the object  
22 associated with the thumbnail, and  
23 iv) generates video outputs based on  
24 A) the two-dimensional location, depth and  
25 state information for each of the  
26 thumbnails,  
27 B) the two-dimensional cursor location, and  
28 C) the three-dimensional environment,



29                    contained in the storage facility; and  
30                    d) a video display unit for rendering the video  
31                    outputs generated by the processing unit.

1        63. A machine readable medium containing data and machine  
2        executable instructions which, when executed by a machine,  
3        performs the method of claim 61.

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